



U.S. Department of Energy
Energy Efficiency and Renewable Energy

Test Procedures for Distribution Transformers

SNOPR Public Meeting

Sampling Plans for Compliance and Enforcement Testing

Building Technologies Program
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

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Sampling Plan for Compliance Testing

- **Purpose: To establish on a one-time basis, the efficiency of the basic model**



Selection of Units for Testing within a Basic Model

1. **For each basic model, select a sample of 5 or more units at random**
 - Production units or units representative of production units
 - If fewer than 5 units are available over a reasonable period, test all units
 - Must use sample size of 5 units or more to substantiate an AEDM



DOE Proposed Sampling Plan – Operating Equation

2. Calculate the average efficiency of the sample and compare it with the requirement of the following operating equation:

$$\bar{X} \geq \frac{100}{1 + \left(1 + \frac{0.05}{\sqrt{n}}\right) \left(\frac{100}{RE} - 1\right)}$$

Where:

\bar{X} = measured average
efficiency of test sample
 n = number of units tested
 RE = rated efficiency

Expressed in terms of power loss:

$$\bar{X}_l \leq RL \left(1 + \frac{0.05}{\sqrt{n}}\right)$$

Where:

\bar{X}_l = measured average power
loss of sample
 n = number of units tested
 RL = represented power loss



DOE Proposed Sampling Plan – Operating Equation (*continued*)

- The magnitude and functionality of the "expanded uncertainty" term, $(0.05/\sqrt{n})$, affect results
- Methodology similar to the statistical z-test
- Statistical basis and operating characteristics are discussed in NIST Technical Note 1456



Other Issues?

- **An opportunity for stakeholders to discuss other issues related to the proposed sampling plan for a distribution transformer.**



Enforcement Testing

- **Enforcement testing procedure is consistent with that used for consumer products (10 CFR Part 430) and electric motors (10 CFR Part 431)**
- **Key points of the Enforcement Testing procedure to discuss:**
 - **Test Notice**
 - **Test Unit Selection and Preparation**
 - **Sampling Plan for Enforcement Testing**
 - **Testing at Manufacturer's Option**

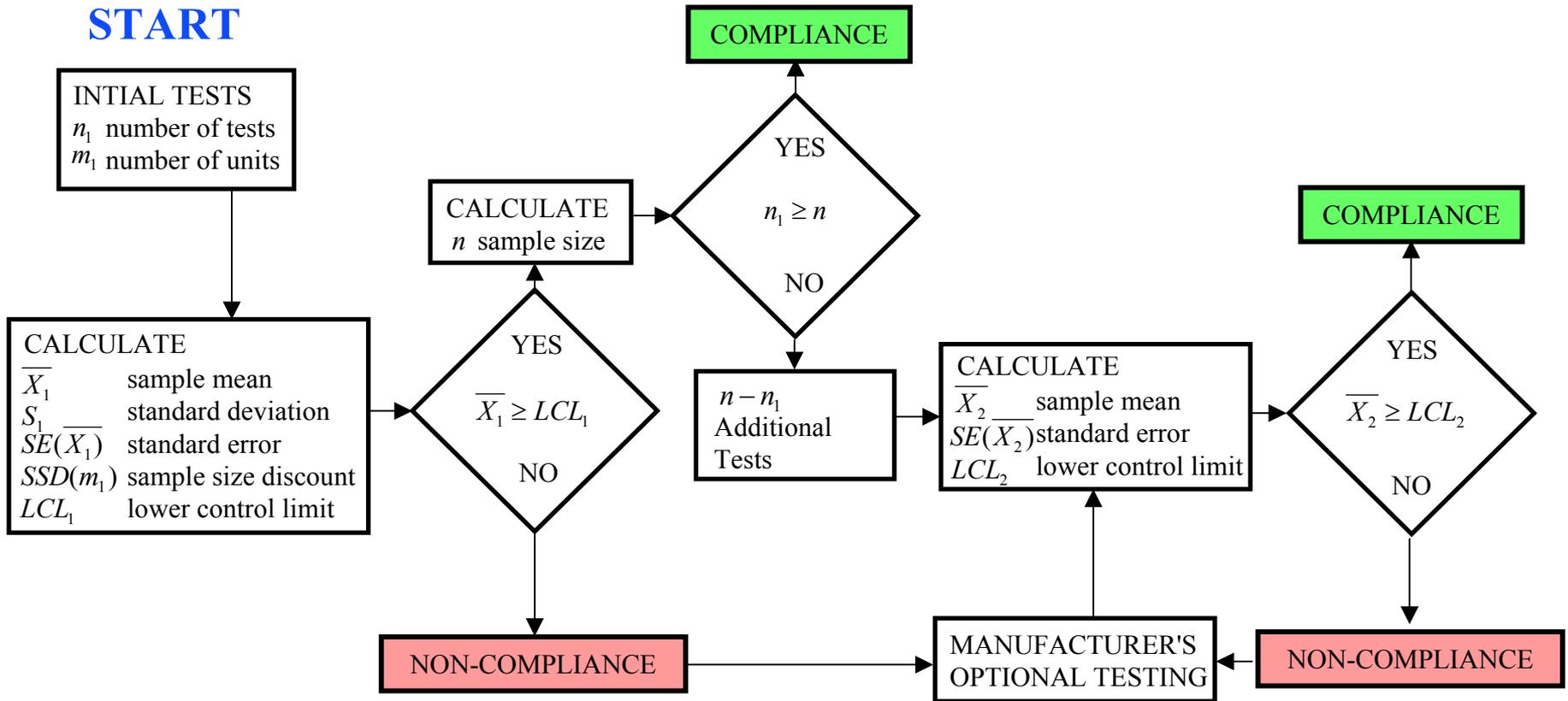


Sampling Plan for Enforcement Testing

- **Test method: DOE test procedure**
- **Up to 20 units may be selected for testing**
- **Five units are tested initially**
- **The Sampling Plan**
 - **97.5% confidence limit**
 - **Five percent tolerance on losses**
- **Allowances for limited testing**



Sampling Plan Flow Chart (Appendix B to Subpart B of Part 432)





Other Issues?

- **An opportunity for stakeholders to discuss other issues related to enforcement testing of a distribution transformer.**